



Beryllium Advanced Technology Assessment Team

◆ A Final Report

Kathryn Creek, MS,
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Acknowledgements

- ◆ Bill Barkman, Y-12
- ◆ Tony Woltermann, WSRS
- ◆ Tom Rising, LANL
- ◆ Steve Abeln, LANL

Background

- ◆ The DOE *Chronic Beryllium Disease Prevention Program Rule*, 10 CFR Part 850, requires beryllium surface and air monitoring to determine health risk and the effectiveness of mechanisms used to minimize or eliminate that risk.
- ◆ Current analytical techniques involve substantial delays and costs.



Beryllium Particulates and Their Detection

February 13 & 14, 2002 • Eldorado Hotel in Santa Fe



- ◆ Symposium hosted by Network of Senior Scientists and Engineers (NSSE) and LANL
- ◆ Beryllium Advanced Technology Assessment Team (BeATAT) formed as a result of information learned at symposium

NSSE Charter

The NSSE is an advisory and working group of production plant technical personnel focused on:

- ◆ nuclear weapons stockpile issues,
- ◆ science-based manufacturing,
- ◆ joint technical endeavors, and
- ◆ enhancing and maintaining resources that are critical to the continuing success of the nuclear weapons complex.

NSSE recommendations are presented to both Plant management and the Department Of Energy.



NSSE's Advanced Technology Assessment Teams

- ◆ Assess NWC Technology Needs & Status.
- ◆ Assess Industry/Academia Capabilities
- ◆ Seek Collaborative Opportunities
- ◆ Recommendations



Be ATAT Tasks

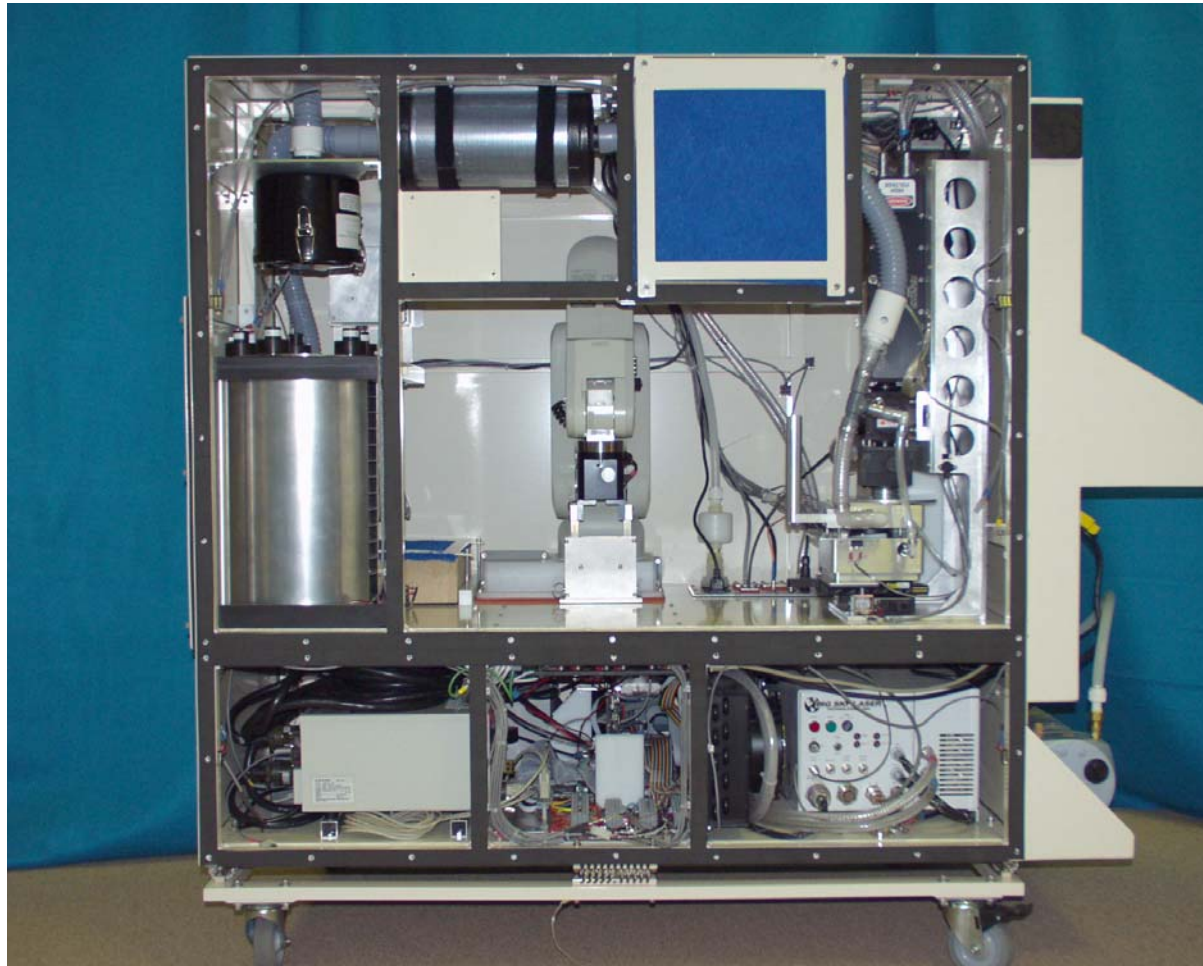
- ◆ Specifications for instruments or methods
- ◆ Standard protocols for method testing
- ◆ Plan for validation of instruments
- ◆ Communication
- ◆ Funding resource list
- ◆ Priority research list



**Recommendations to NNSA, DOE and
Nuclear Weapons Complex**

Objectives of beryllium real-time monitoring

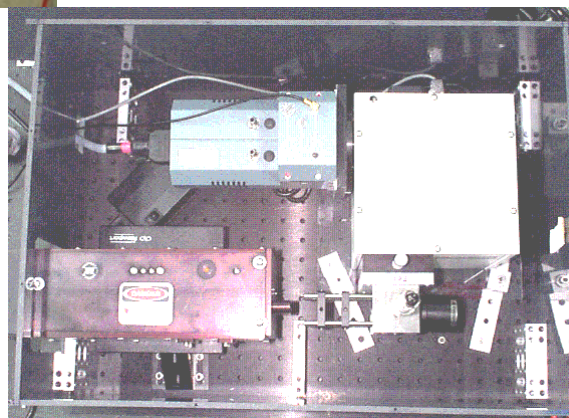
- ◆ Improved worker and public protection
 - Basis for engineering/administrative controls/PPE
 - Timely feedback to workers
- ◆ Improved productivity
 - Movement of Materials
 - Personnel efficiency
 - Reduced analytical laboratory costs
- ◆ Characterize contamination migration
- ◆ Evaluate legacy areas



AEROSOL-FOCUSING LASER-INDUCED-BREAKDOWN SPECTROSCOPY



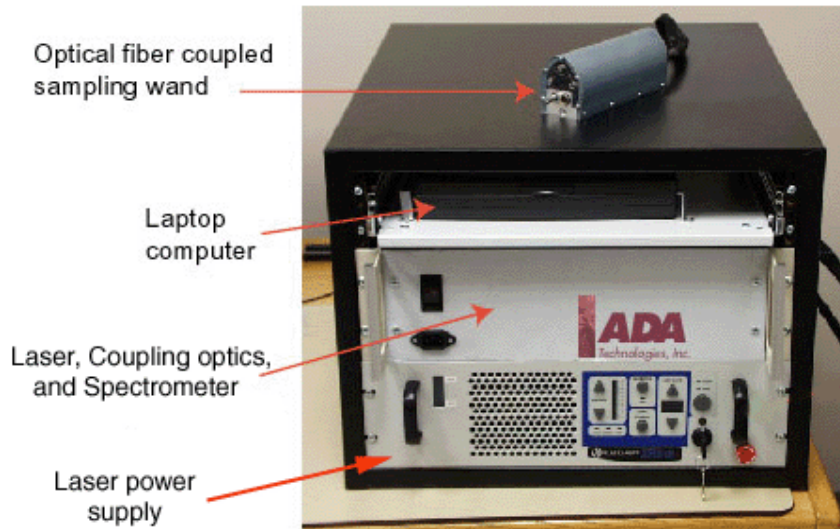
Portable unit enables in-situ measurement of the elemental composition of airborne particulate matter in near-real time.



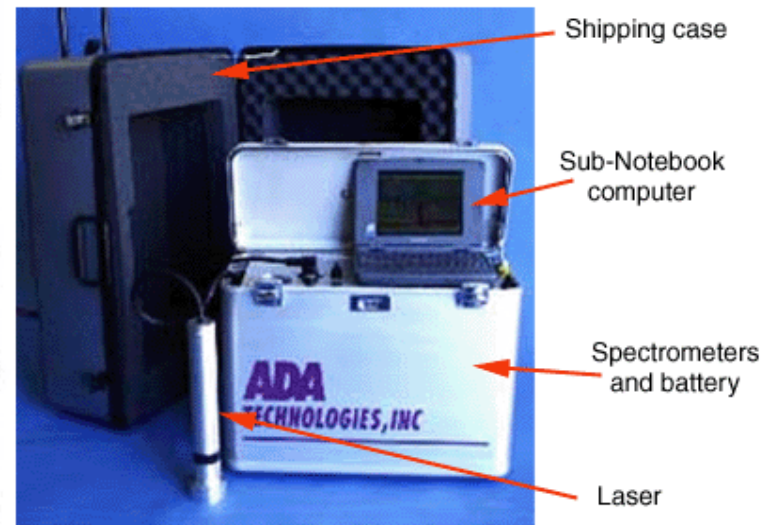
Instrument has a capability for the simultaneous, multi-element analysis of airborne particles.

ADA's LIBS Instruments

LIBS Instrument for D&D



Field portable multi-metals in soils



2000 R&D 100 Entry

Los Alamos Monitor for Air Particulates (LA-MAP)

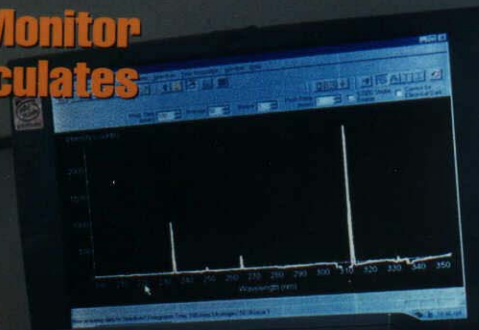
Yixiang Duan

*Continuous, real-time
air-particulate
monitoring*

*Identifies hazardous
elements; instantly
protects workers*

*Highly sensitive,
portable, lightweight*

*Effective inside or
outdoors*



Los Alamos
NATIONAL LABORATORY

 **Los Alamos**

Amzil BAM System



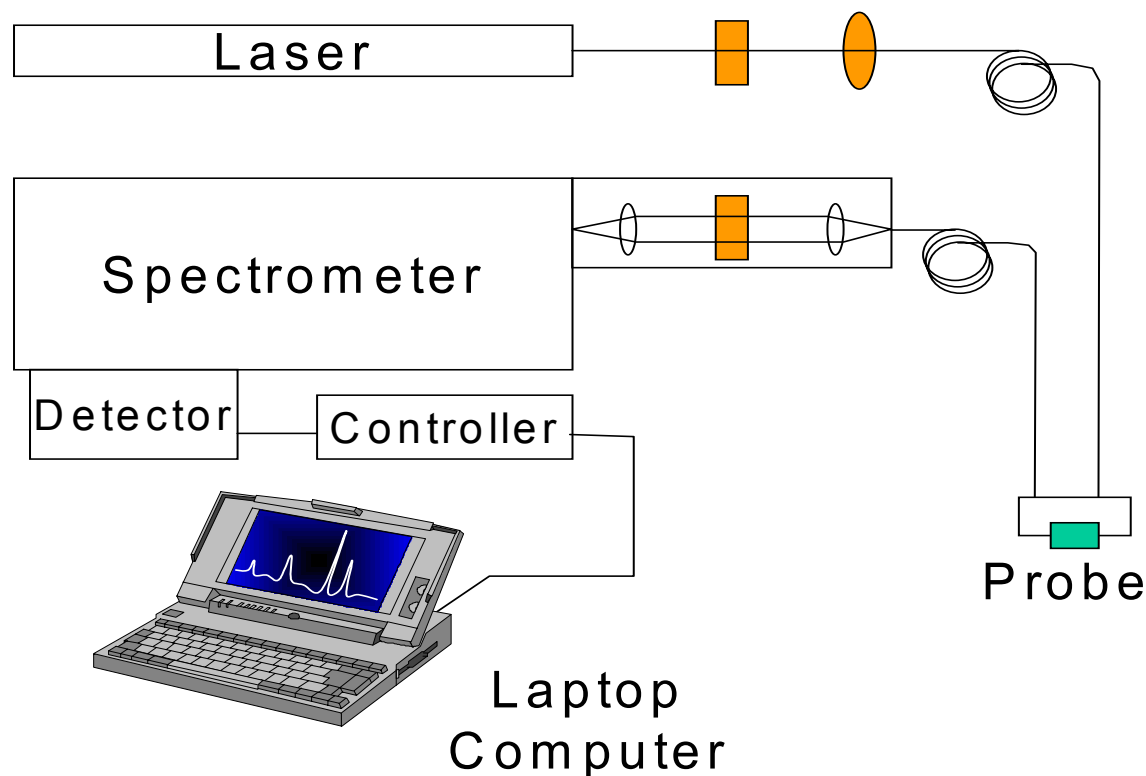
- High Sensitivity
- High Sampling Rate
- Complete Particulate Volatilization
- Air Cooled
- Operates on Electricity & Air
- Robust Cart Mounted Package
- Completely Automatic
- Simple Touch Screen Interface
- Full Gear Operation



Surface-Enhanced Raman Scattering

SERS

Raman Instrumental Setup



Adsorptive Stripping Voltammetry Analysis of Beryllium in Dusts and Air Samples





Be ATAT Members

- ◆ Kathy Creek, Chair, LANL
- ◆ Mike Brisson, WSRS
- ◆ Mark Hoover, NIOSH
- ◆ Dave Weitzman, DOE EH
- ◆ Bret Clausen, RFETS
- ◆ Ken Meyer, PX
- ◆ Bill Frede, KC
- ◆ Ed Kahal, WSRS
- ◆ Sam Robinson, Y-12
- ◆ Larry Jones, DOE Y-12
- ◆ George Fulton, LLNL
- ◆ John Lemming, PX
- ◆ Greg Day, NIOSH
- ◆ Dave Hamel, OSHA
- ◆ John Bishop, NERL, Navy
- ◆ Ron Staubly, NETL
- ◆ Murray Moore, LANL

Accomplishments to date

- ◆ Briefed NNSA and DOE ESH on basic issue
- ◆ White paper on need for real-time monitoring
- ◆ Near final draft of criteria and protocols for testing
- ◆ Web page, “Beryllium Particulates and Their Detection”
- ◆ Funding resource list
- ◆ Priority (or timeline)

Status of Technology Development

◆ Ten instruments/methods

- » Technology development-2

- » Prototype – 3

- » Out of business – 1

- » Commercial instruments -4

- One only qualitative, one never tested with beryllium, two over \$300k and very large

◆ Zero instruments validated

Criteria

- ◆ Range, minimum detection limit, linearity, accuracy, precision, interferences
- ◆ Data logging
- ◆ Communications
- ◆ Calibration
- ◆ Chamber design

Evaluation Protocol

- ◆ Weighted Ranking
- ◆ Laboratory and field evaluation
- ◆ Air and surface instruments
- ◆ Includes design/workmanship, maintenance, calibration, QC, sampling capture, sample chamber, beryllium measurement particle size, operation, data management, and cost

Funding Resource List

- ◆ DOE
- ◆ NNSA
 - » ADAPT
- ◆ PDRD or LDRD
- ◆ NIH
- ◆ DoD

Path Forward

- ◆ Phase I– Start up
- ◆ Phase II – Instrument Development
- ◆ Phase III– Instrument Verification
- ◆ Phase IV– Instrument
Manufacture/Deployment

Phase I- Start Up

- ◆ Identify blue ribbon panel of experts
 - » Finalize criteria with assistance of contractor
 - » Select 3-4 technologies for final development
- ◆ Establish contract for management of instrument development/evaluation
- ◆ Establish contract to certify standard test materials
- ◆ Year 1

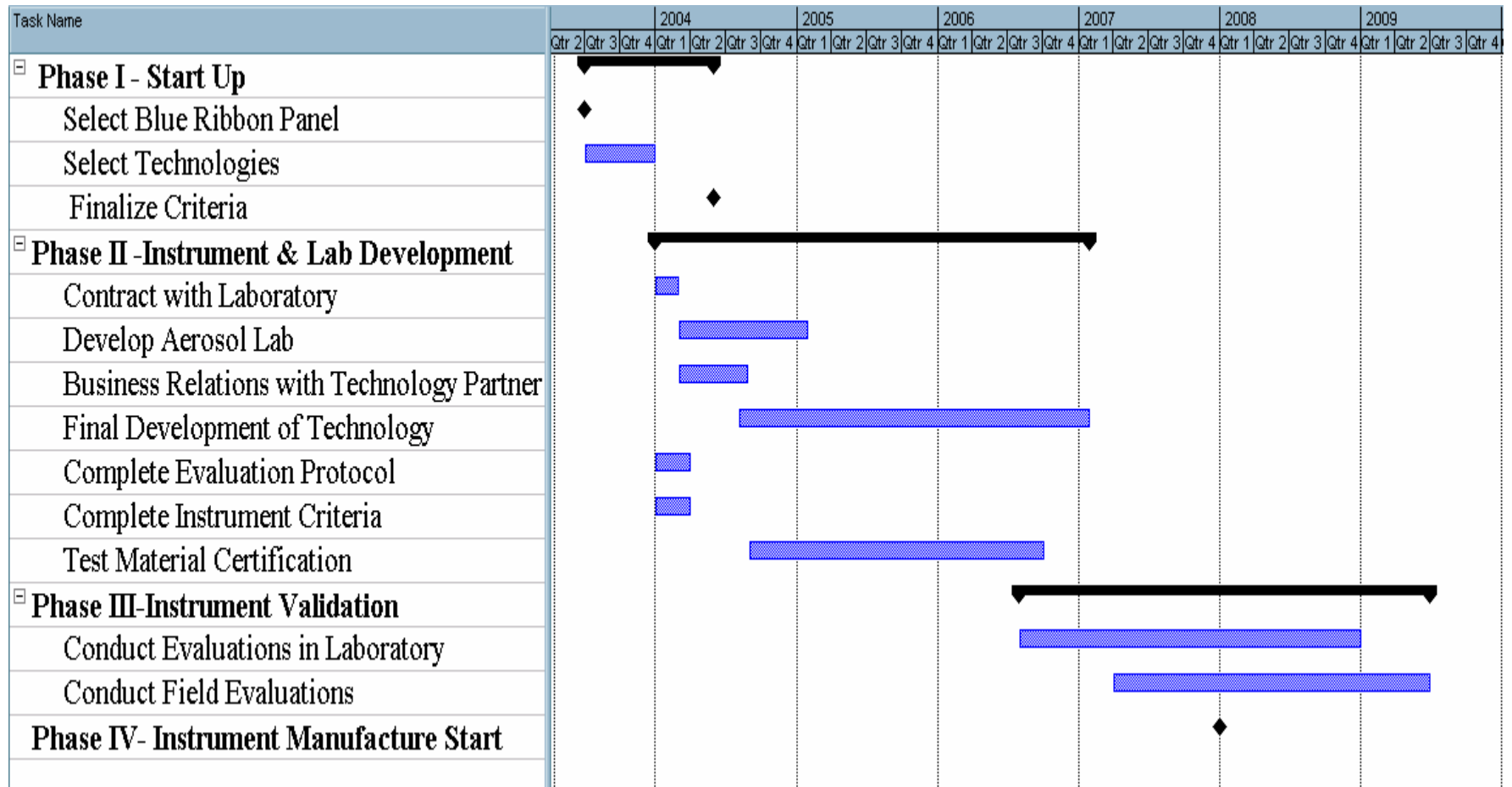
Phase II – Instrument Development

- ◆ Contractor to manage instrument development
 - » Develop beryllium aerosol laboratory
 - » Complete criteria and evaluation protocol document
 - » Establish business relationships with technology partners to meet final criteria for instrument performance
- ◆ Contractor to make and certify standard reference materials
- ◆ Year 2 to 4
- ◆ \$1.5 to 2.0M; lab development
- ◆ \$2.0 to 3.0M/year; operating costs

Phase III – Instrument Verification

- ◆ Contractor to manage verification
 - » Establish Qualified Test Bed
 - » Evaluate or validate instrument performance in laboratory
 - » Evaluate instrument performance in field setting
- ◆ Use EPA's Environmental Technology Verification as model
- ◆ Year 5 on
- ◆ \$0.5 to 1M/year

Timeline



Program Needs

- ◆ Endorsement of approach
- ◆ Authorization to establish interagency agreements (DOE, NNSA, NIOSH, DoD, NIST, EPA, OSHA) to accomplish needed work
- ◆ Assistance in providing required funding, staffing, and facilities